AMENDMENT TO THE CLAIMS

A listing of claims follows:

1. (Previously Presented) A method comprising:

applying a set of one or more connectivity constraints that include quality of service (QoS) based criteria on a physical network topology of a wave length division multiplexing optical network to divide said optical network into separate service levels; and

determining service level topologies for each of said service levels for each node in the optical network.

2. (Original) The method of claim 1, wherein said QoS based criteria includes one or more of bandwidth, bit error rate, optical signal to noise ration, peak noise level, and re-routing priority.

3. (Original) The method of claim 1, wherein said determining includes determining, for each service level, a service level topology for the network.

4. (Cancelled)

5. (Original) The method of claim 1, wherein said set of connectivity constraints also includes a set of one or more conversion criteria.

6. (Original) The method of claim 1, wherein said set of connectivity constraints also includes a conversion free connectivity constraint.

7. (Previously Presented) A method comprising:

maintaining in each node of a wave length division multiplexing optical network a classification by QoS criteria of wavelengths for each link of the wave length division multiplexing optical network, said QoS criteria defining a plurality of service levels; and

for each of said plurality of service levels, maintaining service level connectivity from each node to other nodes of the wave length division multiplexing optical network based on a conversion criteria.

8. (Original) The method of claim 7, wherein said QoS based criteria includes one or more of bandwidth, bit error rate, optical signal to noise ration, peak noise level, and re-routing priority.

9. (Original) The method of claim 7, further comprising:

tracking said wavelengths for each of said links by operating a link management protocol in each of the nodes of the optical network.

10. (Original) The method of claim 7, wherein said maintaining said classification includes comparing parameters of each of the wavelengths to service level parameters, wherein there is a service level parameter for each of said plurality of service levels for each of said QoS criteria.

11. (Original) The method of claim 10, wherein said maintaining said classification includes each node of said optical network performing said comparing.

12. (Original) The method of claim 7, wherein the service level connectivity for each of said plurality of service levels includes the available wavelengths and the status as either allocated or unallocated.

13. (Original) The method of claim 7, wherein said conversion criteria represents the number of wavelength conversion s allowable for a given optical circuit.

14. (Previously Presented) An apparatus comprising:

a wavelength division multiplexing optical network supporting a plurality of service levels, wherein different wavelengths on at least certain links of said optical network qualify for different ones of said plurality of service levels; and

at least one separate network topology database for each of said plurality of service levels that represents the connectivity between nodes of said optical network using those of the wavelengths that qualify for that service level, wherein each access node of said optical network stores a separate one of said network topology databases for each of said plurality of service levels.

15. (Original) The apparatus of claim 14, wherein the connectivity is conversion free connectivity.

16. (Original) The apparatus of claim 14, wherein said network topology databases are stored in a centralized network server.

17. (Cancelled)

18. (Previously Presented) An apparatus comprising:

for each wavelength on each link of a wavelength division multiplexing optical network, a wavelength parameter for each of a set of QoS based criteria;

for each of a plurality of service levels, a service level parameter for each of said set of QoS based criteria;

for each link of said optical network, a link service level channel set for each of said plurality of service levels representing those of the wavelengths on that link with parameters meeting the service level parameters of that service level; and

for each access node of said optical network, a service level topology structure for each of said plurality of service levels representing connectivity of that access node to others of said access nodes using wavelengths from the link service level channel sets of that service level, wherein each access node stores those of said service level topology structures representing connectivity of that access node.

19. (Original) The apparatus of claim 18, wherein said QoS based criteria includes one or more of bandwidth, bit error rate, optical signal to noise ration, peak noise level, and re-routing priority.

20. (Original) The apparatus of claim 18, wherein each access node of said optical network stores the link service level channel sets of those of the links connected to that access node.

21. (Original) The apparatus of claim 18, wherein said service level topology structures are stored in a centralized network server.

22. (Cancelled)

23. (Original) The apparatus of claim 18, wherein each of said service level topology structures stores those paths for which the intersection of the link service level channel sets of the links of that path is not null.

24. (Original) An apparatus comprising:

an access node, to be coupled in a wavelength division multiplexing optical network, including,

a link state database to store, for each link connected to said access node, a link state structure to store a port of the access node to which that link is connected, available wavelengths on that link, and parameters of those wavelengths;

a service level parameter database to store, for each of a set of one or more supported service levels, a service level parameter for each of a set of QoS based criteria; and

a service level connectivity database to store, for each of said set of service levels, a service level topology structure that stores a representation of the service level topology of that service level for said access node.

25. (Original) The apparatus of claim 24, wherein said QoS based criteria includes one or more of bandwidth, bit error rate, optical signal to noise ration, peak noise level, and re-routing priority.

26. (Original) The apparatus of claim 24, wherein each of said service level topology structures stores paths to those of other access nodes of said optical network that can be

reached with those of said wavelengths that qualify for the service level of that service level topology structure.

27. (Original) The apparatus of claim 24, wherein each of said service level topology structures stores available paths to other access nodes in said optical network.

28. (Original) The apparatus of claim 27, wherein each of said paths is a series of two or more nodes connected by links on which there are wavelengths at the service level of that path.

29. (Original) The apparatus of claim 27, wherein each of said paths is a set of one or more links and a set of wavelengths that are at the service level of that path and that are available on every one of said set of links.

30. (Original) The apparatus of claim 24, wherein said access nodes also includes a set of one or more modules to, responsive to request to change the service level of a given provisioned service, allocate a new communication path at a different one of the service levels than a previous communication path, begin routing traffic of the service on the new communication path, and deallocate the previous communication path.

31. (Original) A method for an access node of a wavelength division multiplexing optical network, said method comprising:

for each link to an adjacent node of said wavelength division multiplexing optical network, said access node classifying wavelengths on that link according to a set of one or more service level parameters for each of a plurality of service levels;

for each of said plurality of service levels, instantiate a service level topology structure; and

responsive to receiving information regarding connectivity at each of said plurality of service levels to other access nodes in said optical network, adding such information to said service level topology structure for that service level.

32. (Original) The method of claim 31, wherein said classifying is based on one or more of bandwidth, bit error rate, optical signal to noise ration, peak noise level, and re-routing priority.

33. (Original) The method of claim 31, further comprising:

for each link to an adjacent node, tracking said wavelengths by operating a link management protocol.

34. (Original) The method of claim 31, wherein said classifying includes comparing parameters of each of the wavelengths to the sets of service level parameters.

35. (Original) The method of claim 31, wherein said adding includes, for each of said service level topology structures, storing paths to those of other access nodes of said optical network that can be reached with those of said wavelengths that qualify for the service level of that service level topology structure.

36. (Original) The method of claim 35, wherein each of said paths is a series of two or more nodes connected by links on which there are wavelengths at the service level of that path.

37. (Original) A machine-readable medium that provides instructions that, if executed by a processor, will cause said processor to perform operations comprising:

for each link to an adjacent node of a wavelength division multiplexing optical network, classifying wavelengths on that link according to a set of one or more service level parameters for each of a plurality of service levels;

for each of said plurality of service levels, instantiate a service level topology structure; and

responsive to receiving information regarding connectivity at each of said plurality of service levels to other access nodes in said optical network, adding such information to said service level topology structure for that service level.

38. (Original) The machine-readable medium of claim 37, wherein said classifying is based on one or more of bandwidth, bit error rate, optical signal to noise ration, peak noise level, and re-routing priority.

39. (Original) The machine-readable medium of claim 37, the operations further comprising:

for each link to an adjacent node, tracking said wavelengths by operating a link management protocol.

40. (Original) The machine-readable medium of claim 37, wherein said classifying includes comparing parameters of each of the wavelengths to the sets of service level parameters.

41. (Original) The machine-readable medium of claim 37, wherein said adding includes, for each of said service level topology structures, storing paths to those of other

access nodes of said optical network that can be reached with those of said wavelengths that qualify for the service level of that service level topology structure.

42. (Original) The machine-readable medium of claim 41, wherein each of said paths is a series of two or more nodes connected by links on which there are wavelengths at the service level of that path.

43. (Previously Presented) A method comprising:

receiving a request for a communication path starting at a source node in an wavelength division multiplexing optical network;

selecting a first of a plurality of service level, wherein different wavelengths on at least certain links of said optical network qualifying for different ones of said plurality of service levels forms a different service level topology for each of said plurality of service levels for each access node of said optical network;

selecting a path and a wavelength on said path using a database that stores, for each of the plurality of service levels, a representation of available paths from the source node to other access nodes in said optical network and a separate service level topology structure for each of said service level topologies of said source node, wherein each path is a series of two or more nodes connected by links having a set of one or more wavelengths at the same service level; and

causing allocation of the selected wavelength in the series of nodes of the selected path.

44. (Original) The method of claim 43, wherein said communication path is a lightpath.

45. (Original) The method of claim 43, wherein said communication path is an optical circuit.

46. (Original) The method of claim 43, wherein said selecting said path and said allocation is performed in real time.

47. (Cancelled)

48. (Original) The method of claim 47, wherein the database includes the available wavelengths and the status as either allocated or unallocated.

49. (Original) The method of claim 43, wherein said database stores, for each of the plurality of service levels, a representation of available conversion free paths from the source node to other access nodes in said optical network.

50. (Previously Presented) A machine-readable medium that provides instructions that, if executed by a processor, will cause said processor to perform operations comprising:

responsive to receiving a request for a communication path starting at a source node in an wavelength division multiplexing optical network, selecting a first of a plurality of service levels, wherein different wavelengths on at least certain links of said optical network qualifying for different ones of said plurality of service levels forms a different service level topology for each of said plurality of service levels for each access node of said optical network;

selecting a path and a wavelength on said path using a database that stores, for each of the plurality of service levels, a representation of available paths from the source node to other access nodes in said optical network and a separate service level topology structure for each of said service level topologies of said source node, wherein each path is a series of two or more nodes connected by links having a set of one or more wavelengths at the same service level; and

causing allocation of the selected wavelength in the series of nodes of the selected path.

51. (Original) The machine-readable medium of claim 50, wherein said communication path is a lightpath.

52. (Original) The machine-readable medium of claim 50, wherein said communication path is an optical circuit.

53. (Original) The machine-readable medium of claim 50, wherein said selecting said path and said allocation is performed in real time.

54. (Cancelled)

55. (Previously Presented) The machine-readable medium of claim 50, wherein the database includes the available wavelengths and the status as either allocated or unallocated.

56. (Original) The machine-readable medium of claim 50, wherein said database stores, for each of the plurality of service levels, a representation of available conversion free paths from the source node to other access nodes in said optical network.

57. (Previously Presented) A method comprising:

receiving a request to change a service provisioned with a communication path established in a wavelength division multiplexing optical network at one of a plurality of service levels to a different one of said plurality of service levels, wherein different wavelengths on at least certain links of said optical network qualifying for different ones of said plurality of service levels forms a different service level topology for each of said plurality of service levels for each access node of said optical network;

selecting a path and a wavelength on said path using a database that stores, for each of the plurality of service levels, a representation of available paths from a source node of said communication path to other access nodes in said optical network and a separate service level topology structure for each of said service level topologies of said source node, wherein each path is a series of two or more nodes connected by links having a set of one or more wavelengths at the same service level;

causing allocation of the selected wavelength in the series of nodes of the selected path to form a new communication path; and

transitioning said service to the new communication path.

58. (Original) The method of claim 57, wherein said communication path is a lightpath.

59. (Original) The method of claim 57, wherein said communication path is an optical circuit.

60. (Original) The method of claim 57, wherein said selecting said path and said allocation is performed in real time.

61. (Cancelled)

62. (Original) The method of claim 57, wherein said database stores, for each of the plurality of service levels, a representation of available conversion free paths from the source node of said communication path to other access nodes in said optical network.

63. (Original) The method of claim 57, wherein said transitioning includes:

moving traffic from the previous communication path to the new communication path; and

deallocating the previous communication path.

64. (Previously Presented) A machine-readable medium that provides instructions that, if executed by a processor, will cause said processor to perform operations comprising:

responsive to receiving a request to change a service provisioned with a communication path established in a wavelength division multiplexing optical network at one of a plurality of service levels to a different one of said plurality of service levels, selecting a path and a wavelength on said path using a database that stores, for each of the plurality of service levels, a representation of available paths from a source node of said communication path to other access nodes in said optical network and a

separate service level topology structure for each of said service level topologies of said source node, wherein different wavelengths on at least certain links of said optical network qualifying for different ones of said plurality of service levels forms a different service level topology for each of said plurality of service levels for each access node of said optical network, wherein each path is a series of two or more nodes connected by links having a set of one or more wavelengths at the same service level;

causing allocation of the selected wavelength in the series of nodes of the selected path to form a new communication path; and

transitioning said service to the new communication path.

65. (Original) The machine-readable medium of claim 64, wherein said communication path is a lightpath.

66. (Original) The machine-readable medium of claim 64, wherein said communication path is an optical circuit.

67. (Original) The machine-readable medium of claim 64, wherein said selecting said path and said allocation is performed in real time.

68. (Cancelled)

69. (Original) The machine-readable medium of claim 64, wherein said database stores, for each of the plurality of service levels, a representation of available conversion free paths from the source node of said communication path to other access nodes in said optical network.

70. (Original) The machine-readable medium of claim 64, wherein said transitioning includes:

moving traffic from the previous communication path to the new communication path; and

deallocating the previous communication path.

71. (Previously Presented) A machine-readable medium having stored thereon data comprising:

a service level connectivity database for an access node of a wave division multiplexing optical network, wherein each link of said optical network includes a set of zero or more lamdas for each of a plurality of service levels, each of said plurality of service levels includes a set of zero of more possible end to end paths comprised of a series of one or more links that include one or more lamdas of that service level, wherein the service level connectivity database includes a separate service level topology structure for each of said plurality of service levels, each of said plurality of service level topology structures storing the data for each of the possible end to end paths of that service level that end with said access node, said service level connectivity database including,

for each of the possible end to end paths that end with said access node, data representing,

the series of links of that path; and

the lamdas of that path.

72. (Original) The machine-readable medium of claim 71, further comprising:

a link state database including a link state structure for each node of said optical network adjacent said access node, each of said link state structures including the set of zero lamdas for each of the plurality of service levels.

73. (Cancelled)

74. (Previously Presented) The machine-readable medium of claim 71, wherein each of said service level topology structures is a table.

75. (Original) The machine-readable medium of claim 73, wherein each of said service level topology structures is a tree.